GREYLINE
instruments inc.

USER'S GUIDE

Installation & Operation Instructions

Area-Velocity Flow Meter

Model AVFM 5.0

Manual Series B.1.4

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INDEX

IMPORTANT NOTE: This instrument is manufactured and calibrated to meet product specifications. Please read this manual carefully before installation and operation. Any unauthorized repairs or modifications may result in a suspension of the warranty.

Available in Adobe Acrobat pdf format

CONNECTIONS:

POWER INPUT: 100 to 240 VAC 50/60Hz. No adjustments are necessary for voltages within this range. Connect L (Live) N (Neutral) and AC Ground.

Optional DC: 9-32 VDC. Connect to + and - terminals.

Optional Thermostat and Heater modules are available rated for 115 VAC or 230 VAC.

IMPORTANT NOTE: AC power input and relay connection wires must have conduit entry to the instrument enclosure. Installation requires a switch, overcurrent fuse or circuit breaker in the building (in close proximity to the equipment) that is marked as the disconnect switch.

⚠️ Risk of electric shock. Loosen cover screw to access connections. Only qualified personnel should access connections.
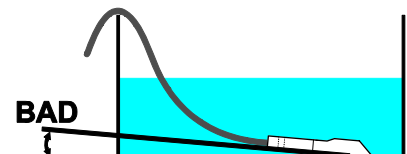
Note: Use of instrumentation over 40°C ambient requires special field wiring.

Note: User replaceable fuse is 2 Amp 250V (T2AL250V).

FUNCTION TEST:

Connect the sensor to the **TDCR** terminals as shown below, then apply power. Allow 30 seconds for the AVFM 5.0 to initialize.

A. Place QZ02L sensor (flat to the bottom) in a bucket of water about 6" deep and select `Level` mode (from `UNITS/MODE` menu) to see a level reading.

B. Select `Velocity` mode and stir the water to see a velocity reading.

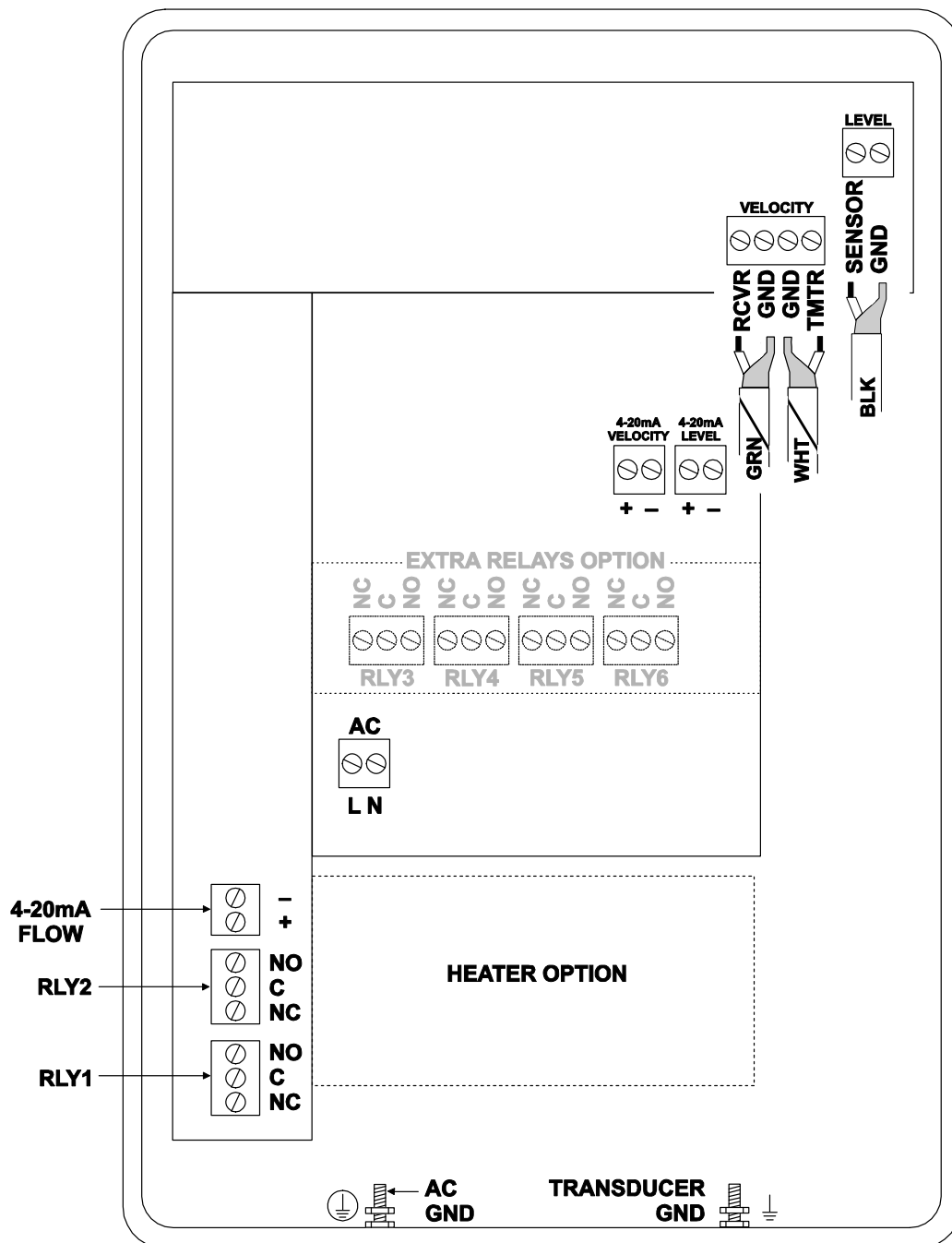## CONNECTIONS

LEVEL
SENSOR
GND
VELOCITY
RCVR
GND
GND
TMTR
BLK

4-20mA VELOCITY
4-20mA LEVEL
GRN
WHT
+ − + −

EXTRA RELAYS OPTION

NC C NO	NC C NO	NC C NO	NC C NO
RLY3	RLY4	RLY5	RLY6

AC
L N

4-20mA FLOW — **− +**

RLY2 — **NO C NC**

HEATER OPTION

RLY1 — **NO C NC**

AC GND   **TRANSDUCER GND**
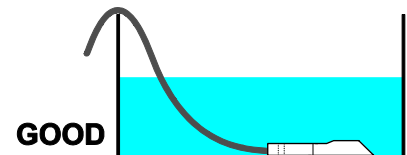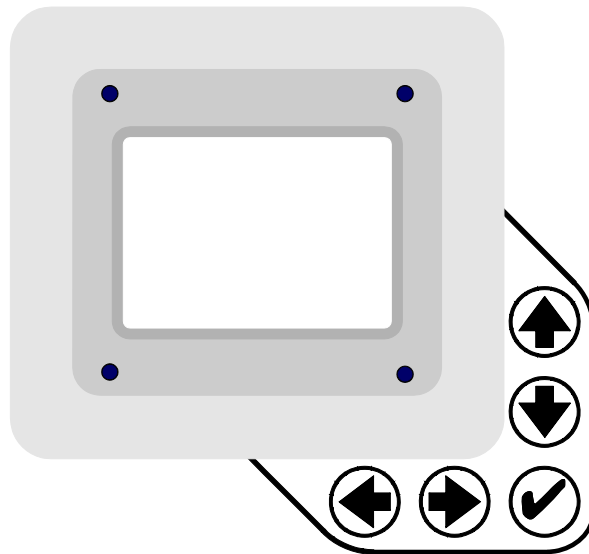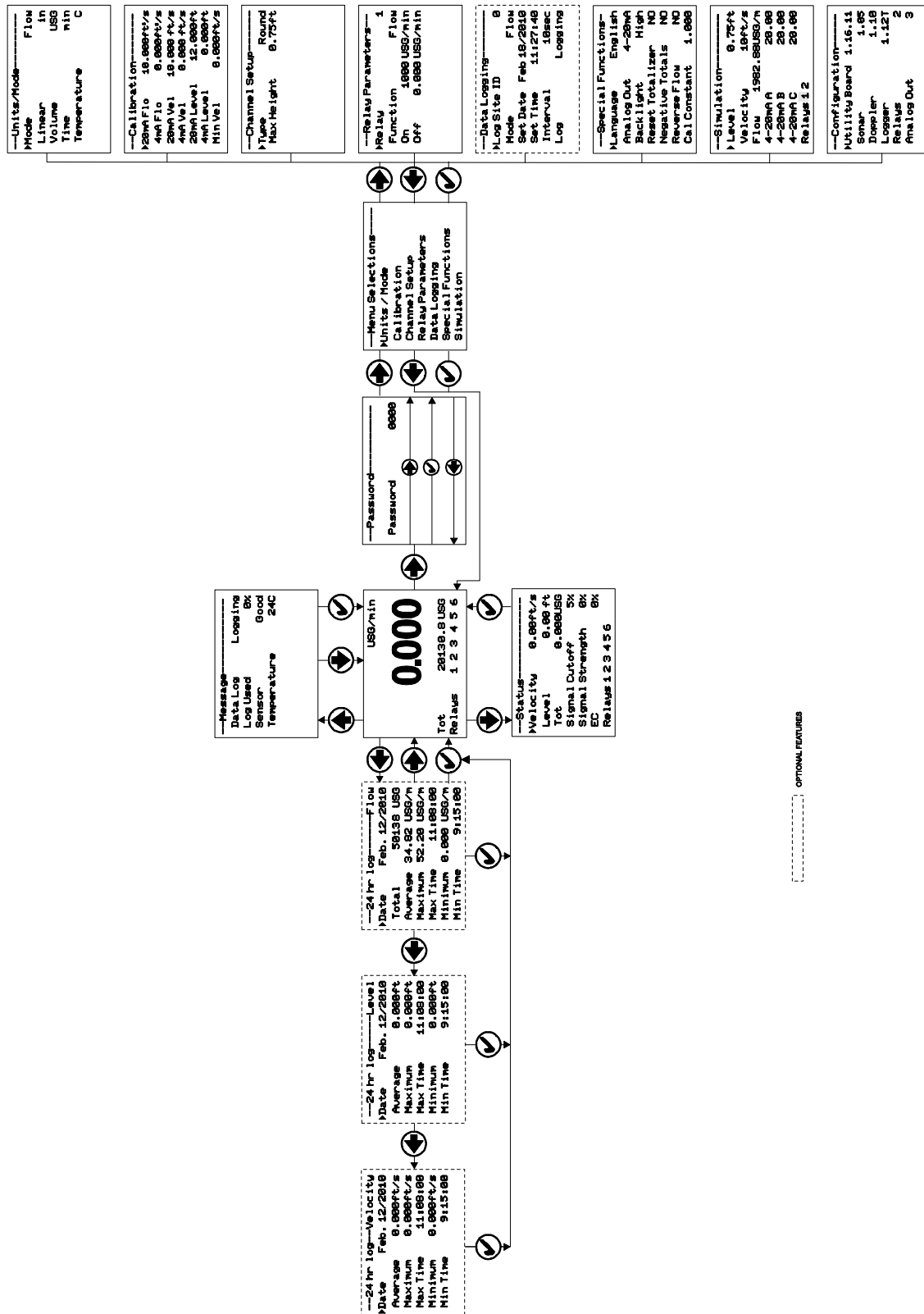
KEYPAD SYSTEM

The AVFM 5.0 uses a menu system. Arrows show the four directions to leave a menu box. Pressing a corresponding keypad arrow will move to the next item in the direction shown. Move the cursor (underline) under numerals and increase or decrease numerals with the ⬆ and ⬇ keys.

To store calibration values permanently (even through power interruptions), press ✓.

CALIBRATION MENU

—Units/Mode—
Mode Flow
Linear in
Volume USG
Time min
Temperature C

—Calibration—
20mA Flo 10.000ft/s
4mA Flo 0.000ft/s
20mA Vel 10.000 ft/s
4mA Vel 0.000 ft/s
20mA Level 12.000ft
4mA Level 0.000ft
Min Vel 0.000ft/s

—Channel Setup—
Type Round
Max Height 0.75ft

—Relay Parameters—
Relay 1
Function Flow
On 1000 USG/min
Off 0.000 USG/min

—Data Logging—
Log Site ID 0
Mode Flow
Set Date Feb 18/2010
Set Time 11:27:40
Interval 10sec
Log Logging

—Special Functions—
Language English
Analog Out 4-20mA
Backlight High
Reset Totalizer NO
Negative Totals NO
Reverse Flow NO
Cal Constant 1.000

—Simulation—
Level 0.75ft
Velocity 10ft/s
Flow 1002.88USG/m
4-20mA 20.00
4-20mA B 20.00
4-20mA C 20.00
Relays12

—Configuration—
Utility Board 1.16.11
Sonar 1.05
Doppler 1.18
Logger 1.12T
Relays 2
Analog Out 3

—Menu Selections—
Units / Mode
Calibration
Channel Setup
Relay Parameters
Data Logging
Special Function
Simulation

—Password—
Password 0000

USG/min
0.000
Tot 28138.8 USG
Relays 1 2 3 4 5 6

—Message—
Data Log Logging
Log Used 0%
Sensor Good
Temperature 24C

—Status—
Velocity 0.00ft/s
Level 0.00ft
Tot 0.000USG
Signal Cutoff 5%
Signal Strength 0%
EC 0%
Relays 1 2 3 4 5 6

—24 hr log—Flow
Date Feb. 12/2010
Total 59138 USG
Average 34.82 USG/m
Maximum 52.20 USG/m
Max Time 11:08:00
Minimum 0.000 USG/m
Min Time 9:15:00

—24 hr log—Level
Date Feb. 12/2010
Average 0.000ft
Maximum 0.000ft
Max Time 11:08:00
Minimum 0.000ft
Min Time 9:15:00

—24 hr log—Velocity
Date Feb. 12/2010
Average 0.000ft/s
Maximum 0.000ft/s
Max Time 11:08:00
Minimum 0.000ft/s
Min Time 9:15:00

OPTIONAL FEATURES

```
                 USG/min

      0.000
Tot          20130.8 USG
Relays    1 2 3 4 5 6
```

```
--Message-----------
 Data Log      Logging
 Log Used          0%
 Sensor          Good
 Temperature       24C
```

```
--Status------------
▶Velocity    0.00ft/s
 Level        0.00 ft
 Tot         0.000USG
 Signal Cutoff    5%
 Signal Strength  0%
 EC               0%
 Relays 1 2 3 4 5 6
```

RUN

The main display shows the units selected from the `Units/Mode` menu, Flow or Velocity rate being measured, TOTALIZER and RELAY states. The AVFM 5.0 will start-up with this display and will return to this screen after a timeout if keys are not pressed in other menus.

MESSAGE

Press ⬆ from the RUN display to view temperature measurement, status of the data logger and error/warning messages provided by the instrument. The word `Message` will appear on the RUN display if error messages are being generated by the instrument. Refer to the manual section Error/Warning Messages for a description. Press ✓ to return to the main display.

STATUS

Press ⬇ from the RUN display to view instrument status.

`Velocity` Will be displayed in `ft/sec` or `m/sec`.

`Level` Is displayed in the selected units.

`Tot` Displays the current totalizer reading.

`Signal Cutoff` Adjust the setting in percent to suppress flow readings at zero flow when fluid swirling or pipe vibration may cause the instrument to continue reading. Example: `Signal Cutoff` at `5%` will force the display and outputs to zero when signal strength drops below 5%.

`Signal Strength` Displays percentage of signal being received by the ultrasonic sensor.

`EC` Displays level measurement Echo Confidence

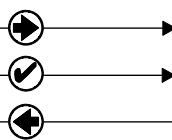`Relays 1 2 3 4 5 6` Energized relays will display with reversed font eg: 2

```
--24 hr log-------Flow
▶Date     Feb. 12/2010
 Total        50138 USG
 Average  34.82 USG/m
 Maximum  52.20 USG/m
 Max Time    11:08:00
 Minimum  0.000 USG/m
 Min Time     9:15:00
```

```
--Password----------

 Password          0000
        ➡
        ✔
    ⬅   ⬅
```

24 HR LOG (Data Logging option only)

Press ⬅ from the RUN display to view a formatted flow report from instruments with a built-in data logger. Press ⬅ to pan through `Level, Velocity` and `Flow` summaries. Press ⬇ to scroll down one day or repeatedly to scroll to a specific date. Up to 365 days can be stored. Newest date will overwrite the oldest. Press ✓ to return to the main display.

PASSWORD

The `Password` (a number from 0000 to 9999) prevents unauthorized access to the `Calibration` menu.

From the Run display press ➡ to get to `Password`. Factory default password is 0000 and if it has not been changed press ✓ to proceed to the `Menu Selections` screen.

If a password is required, press ➡ to place the cursor under the first digit and ⬇ or ⬆ to set the number, then ➡ to the second digit, etc. Press ➡ or ✓ to proceed to the `Menu Selections` screen.

A new password can be stored by going to `Special Functions/New Password.`

```
--Units/Mode---------
▶Mode          Flow
 Linear          in
 Volume         USG
 Time           min
```

UNITS/MODE

From ▶Mode press the ➡ and then the ⬆ or ⬇ to select Flow or Velocity. Flow mode displays the flow rate in engineering units (e.g. gpm, litres/sec, etc.) Press the ✓ to store your selection then the ⬇ to the next menu item.

```
--Units/Mode---------
 Mode          Flow
▶Linear          in
                 ft
                  m
                 mm
```

From ▶Linear press the ➡ key and then the ⬆ or ⬇ to select your units of measurement. Press the ✓ to store your selection.

Press the ⬇ key to move the ▶symbol to each subsequent menu item and the ✓ to save your selections.

Note: the volume selection "bbl" denotes U.S. barrels.

```
--Units/Mode---------

▶Volume         USG
                ft3
                bbl
                  L
                 m3
                IMG
                 IG
               USMG
```

▶ Temperature press ➡ then ⬆⬇ to select C or F.

Press ⬅ or ✓ to return to the Menu Selections screen.

```
--Units/Mode---------
 Mode          Flow
 Linear          in
 Volume         USG
▶Time           sec
                day
                 hr
                min
```

```
--Units/Mode---------
▶Mode          Flow
 Linear          in
 Volume         USG
 Time           min
 Temperature      C
```

```
--Calibration-------
▶20mA Flo    10.000ft³/s
 4mA Flo      0.000ft³/s
 20mA Vel    10.000ft/s
 4mA Vel      0.000ft/s
 20mA Level   12.000ft
 4mA Level     0.000ft
 Min Vel      0.000ft/s
 Min Level    0.083ft
 Lvl Offset   0.000ft
 Damping        10%
 LOE Time      30sec
```

CALIBRATION

Press ⬇ to `Calibration` and ➡ to enter. Use ⬇ or ⬆ to position ▶ before each menu item and ➡ to enter. When settings are completed press ✓ to store and return to the Calibration menu.

`20mA Flo`
[5V Flo]

Press ➡ and enter the flow rate value for 20mA.

Note: Analogue output can be selected as 4-20mA or 0-5V in Special Functions.

`4mA Flo`
[0V Flo]

Press ➡ and enter the flow rate value for 4mA.

`20mA Vel`
[5V Vel]

Press ➡ and enter the velocity value for 20mA.

`4mA Vel`
[0V Vel]

Press ➡ and enter the velocity value for 4mA.

`20mA Level`
[5V Level]

Optional for QZ02L-A type transducer. Press ➡ and enter the level value for 20mA.

`4mA Level`
[0V Level]

Optional for QZ02L-A type transducer. Press ➡ and enter the level value for 4mA.

`MaxRg`

Only for PZ12LP/QZ02L-B type transducer. Press ➡ and enter the zero water level (distance from the PZ12-LP sensor to the zero water level).

`MinRg`

Only for PZ12LP/QZ02L-B type transducer. Press ➡ and enter the max level (distance from the PZ12-LP sensor to the max water level).

`Min Vel`

Press ➡ and enter a minimum velocity cutoff. Forward and reverse velocities less than `Min Vel` will be forced to zero.

`Min Level`

Optional for QZ02L-A type transducer. Press ➡ and enter a minimum level cutoff. Level reading less than `Min Level` will be forced to zero.

Lvl Offset   Optional for QZ02L-A type transducer. Press ➡and enter an offset to level measurement. Set to 0.00 when sensor mounted on floor of channel. When sensor is mounted above the floor of the channel enter the distance between channel floor and bottom of sensor.

Note: 4mA is not affected by Lvl Offset   settings. 4mA is the bottom of the channel or pipe.
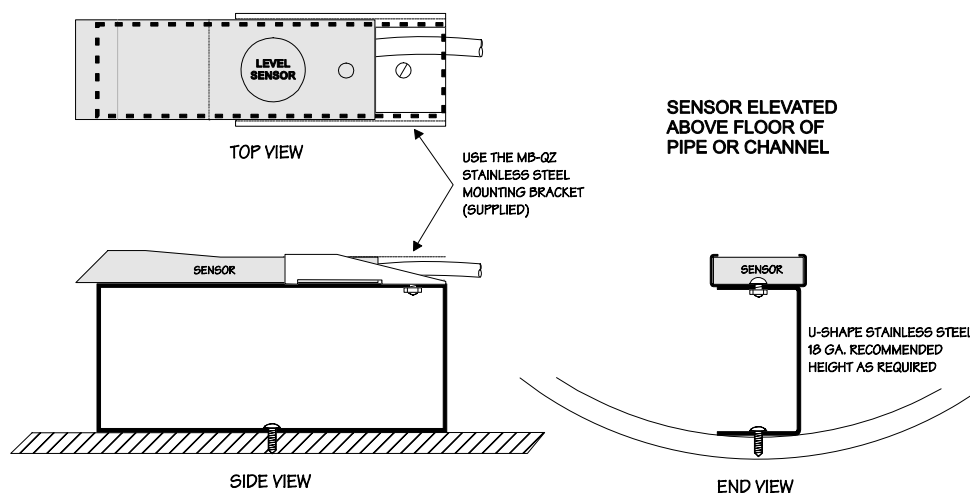
Damping   Increase damping to stabilize readings under turbulent flow readings or to reject spurious level readings. Decrease for faster response to changes in flow.

LOE Time   Press ➡ and enter the number of seconds allowed without receiving an echo before the AVFM 5.0 displays ECHO LOSS, and Control relays change state as calibrated under Relay Parameters.

Press ✓ from the Calibration   display to return to Menu Selections.

```
--Channel Setup------
▶Type          Round
 Max Height   0.75ft
```

CHANNEL SETUP

Round   Select Round for open pipes. Set Max Height to the
               inner diameter of the pipe.

Rectangle   Select Rectangle for rectangular channels. Enter the
               channel width.

Trapezoid   Select Trapezoid for trapezoidal shaped channels.
               Specify the Width and Slope of the channel as shown
   in the following illustration.

$$SLOPE = \frac{x}{y}$$

TRAPEZOIDAL
CHANNEL
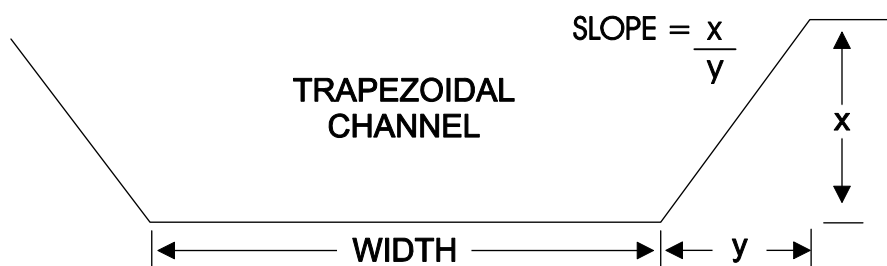
WIDTH   y

Egg   Select Egg for Egg shaped channels. Enter the Max
               Height of the channel.

R   2R
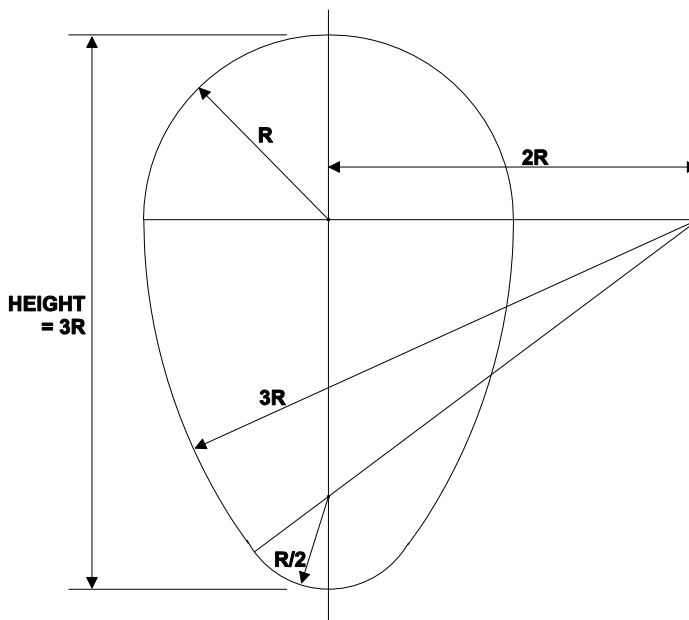
HEIGHT
= 3R   3R   R/2

```
--Custom Channel-----
▶Type          Custom
 Reset Data        No
 Max Height   0.75 ft
 Division     0.05 ft
 Increment #        0
 Width       0.000 ft
 Level       0.000 ft
```

CUSTOM CHANNELS

Reset Data   Old data <u>MUST</u> be removed before entering data for a new channel. Press ➡ then press ⬆ to Yes and press ✓ to clear old data.

Max Height   Enter the maximum height of the channel.

Division   Divide the maximum height into equal increments (maximum of 40) and enter this division value (example 1", 1 cm etc.)

Increment #   Enter the increment number if you want to edit a previous entry or to skip entering widths for some levels (Note: The custom channel will interpolate widths between entry points).

Width   Enter the measured width of the channel at the level shown (Note: To enter 0 width you must press ➡ and then ✓ to store a 0 width data point).

Level   Displays the level of the channel for each increment and width entry.
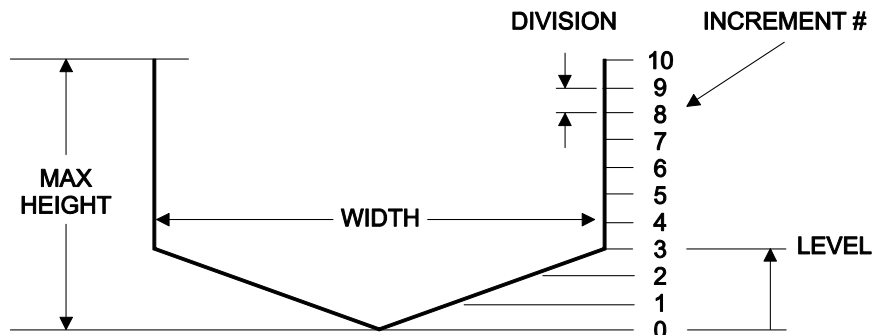
<u>Note</u>:

Custom channel data in equal width increments with variable height measurements must be converted to the format shown above using the "Channel Data Translator" PC software.

```
--Relay Parameters--
▶Relay              1
 Function        Flow
 On          1000 USG
 Off        0.000 USG
```

RELAY PARAMETERS

Relay
: Press ➡ and ⬇ or ⬆ to select a relay (2 relays are standard, 4 additional are optional).

Function
: Press ⬇ or ⬆ to select `Off, Pulse, Flow, Velocity` or `Level`.

Flow
: `On` Position the cursor under the numerals and press ⬇ or ⬆ to set digits to the relay `On` set point.
  `Off` set digits to the `Off` set point.

Pulse
: Press ⬇ and set digits to the flow volume per relay pulse. Use this feature for remote samplers, chlorinators or totalizers. Minimum time between pulses is 2.25 seconds and pulse duration is 350 milliseconds.

  Return to `Relay` and enter settings for each relay.

Velocity On
: Position the cursor under the numerals and press ⬇ or ⬆ to set digits to the relay `On` set point.
  `Off` set digits to the `Off` set point.

Level On
: Position the cursor under the numerals and press ⬇ or ⬆ to set digits to the relay `On` set point.
  `Off` set digits to the `Off` set point.
  `LOE` mode Specify the state of the relay for loss of echo condition: `Off, On` or `Hold`.

  Press ✓ to return to `Menu Selections`

DATA LOGGING (OPTIONAL)

Refer to Options section of this manual.

SPECIAL FUNCTIONS

```
--Special Functions-
▶Language      English
 Analog Out    4-20mA
 Backlight       High
 Reset Totalizer   NO
 Negative Totals   NO
 Reverse Flow      NO
 Cal Constant   1.000
```

```
--Special Functions-
 Language      English
▶Backlight        High
              Medium
                 Low
            Key Hi/Lo
            Key High
             Key Med
             Key Low
                 Off
```

Language	Select `English`, `French` or `Spanish`
`Analog Out`	Select `4-20mA` or `0-5V` mode for the analog output.
`Backlight`	Select `High`, `Medium` or `Low` for continuous backlight.
	Select `Key Hi/Lo` for high backlight (for 1 minute) after a keypress and then `Lo` backlight until a key is pressed again.
	Select `Key High`, `Med` or `Low` for backlight after a keypress and then backlight off until a key is pressed again.
`Reset Totalizer`	Press ➡ and select `Yes` to erase and restart the totalizer at zero.
`Negative Totals`	Select `Yes` to have reverse flow readings deducted from the totalizer. Select `No` to totalize forward flow only and ignore reverse flow.
`Reverse Flow`	Select `Yes` to invert the sign of the flow measurement.
`Cal Constant`	Scales the velocity reading. Set to 1.000 for QZ02L transducer.
`Restore Defaults`	Select `Yes` and press ✓ to erase all user settings and return the instrument to factory default settings.
`New Password`	Select any number from `0000` to `9999` and press ✓. Default setting of 0000 will allow direct access to the calibration menus. Setting of any password greater than 0000 will require the password to be entered to access the calibration menus.

Press ✓ to return to `Menu Selections`.

```
--Simulation--------
▸Level        0.75ft
 Velocity     10ft/s
 Flow    1982.88USG/m
 4-20mA A       20.00
 4-20mA B       20.00
 4-20mA C       20.00
 Relays 1 2
```

SIMULATION

Simulate a level reading and a velocity reading (Press ➡ to change value and ✓ to store).

Review the resulting Flow reading, the three analog outputs (A: Flow, B: Velocity, C: Level) and the relay states. Note: Outputs will follow the displayed values.

Exercises the 4-20mA output, digital display and control relays (does not affect the totalizer or optional data logger).

Press the ✓ to terminate simulation and return to the Menu Selections screen.

INSTALLATION - SENSOR LOCATION

1. Choose a sensor mounting location where silt or deposits are least likely to accumulate.

2. For best results flow should be evenly distributed across the channel and relatively free of turbulence. (The AVFM 5.0 is very effective at averaging level and velocity readings in turbulent conditions, but best accuracy and response time is achieved with evenly distributed flow.)

3. Avoid vertical drops, obstructions or elbows immediately up and downstream from the sensor. Locate the QZ02L sensor at least 10 times maximum Head (level) and 10 times the channel width from these flow disturbances.

QZ02L VELOCITY-LEVEL SENSOR MOUNTING

Mount the QZ02L sensor with the stainless steel bracket and hardware supplied. Ensure that the sensor is parallel to the water surface (check with a level). Mount with the tapered end of the sensor pointing upstream and the sensor cable pointing downstream.

Clip or tie wrap the sensor cable securely to the pipe or channel wall.

Note: The mounting bracket is designed to release the sensor if weeds or rags are caught by the sensor.

GOOD

BAD

END VIEW

SENSOR

SENSOR

SENSOR

FLOW

SENSOR

END VIEW

SENSOR

SENSOR
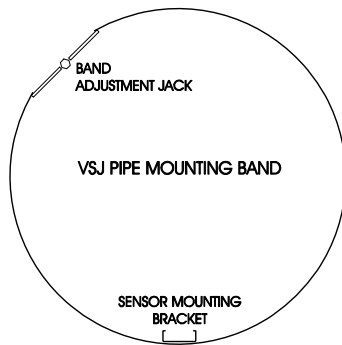
SENSOR

FLOW

SENSOR

SENSOR
END VIEW
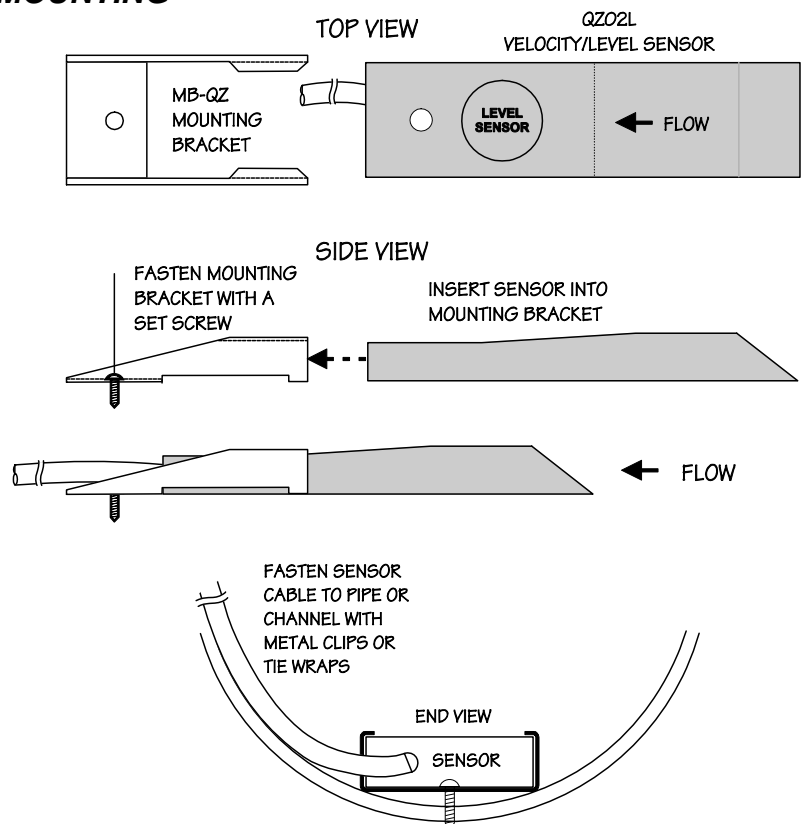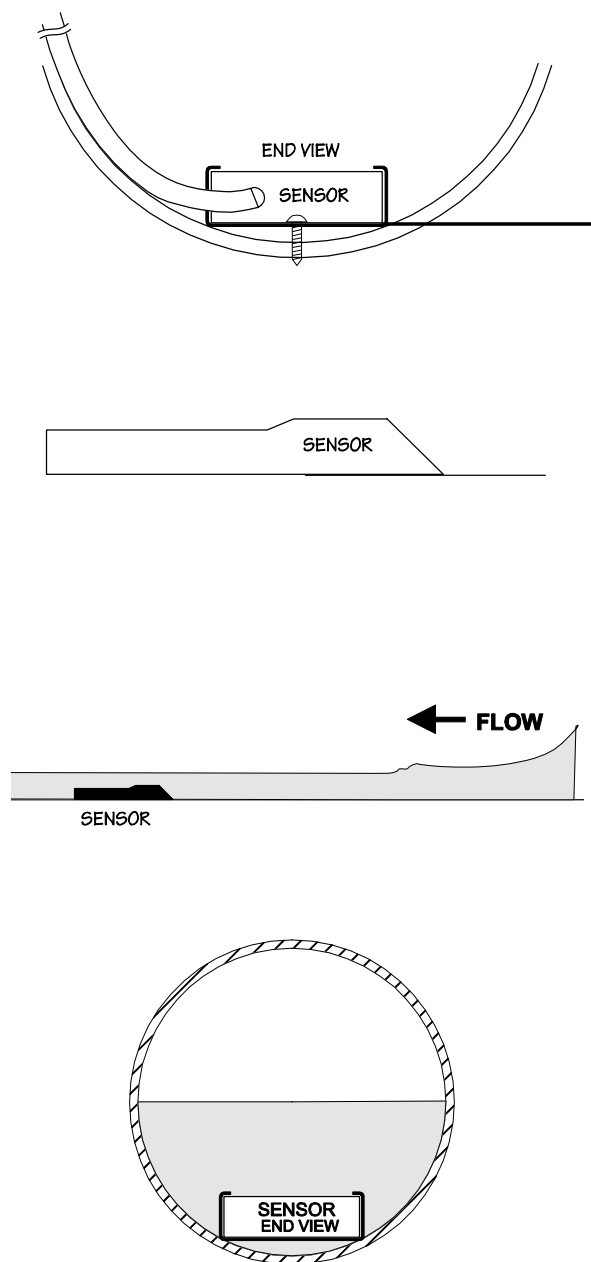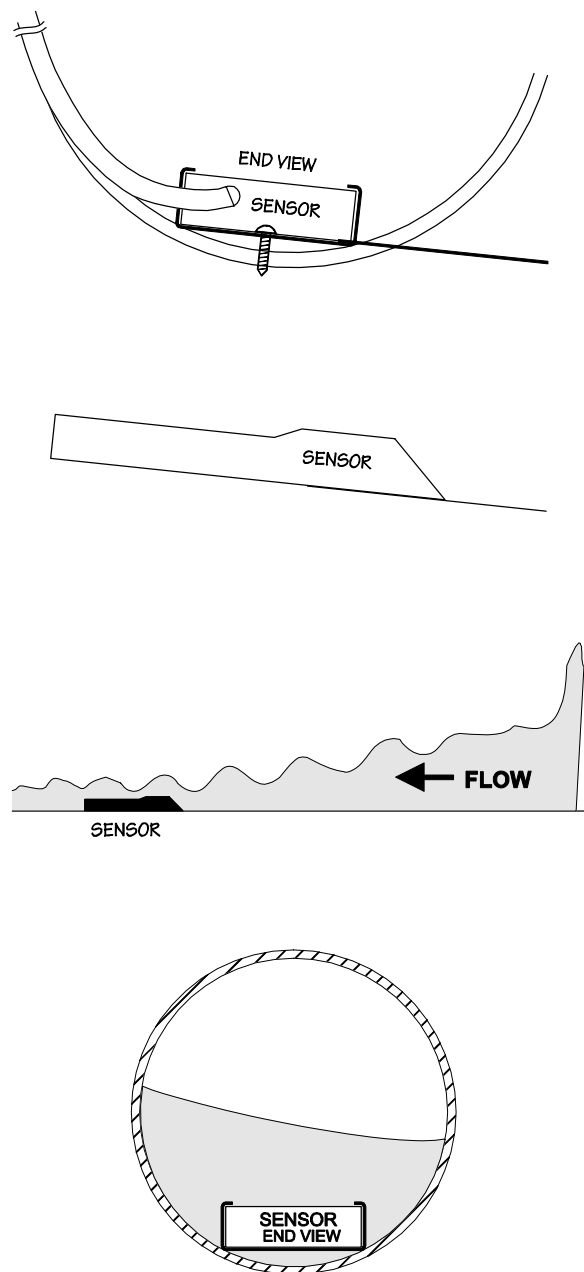
SENSOR
END VIEW

OPTIONAL PIPE BAND MOUNTING WITH QZ02L SENSOR

Install the stainless steel pipe band with the sensor mounting bracket at the invert (bottom) of the pipe. Ensure that the sensor bracket is parallel to the water surface (check with a level). Mount so the tapered end of the sensor will point upstream and the sensor cable will point downstream. (Turn the ¼" adjustment nut clockwise to expand the bracket and secure to the pipe wall by friction fit.)
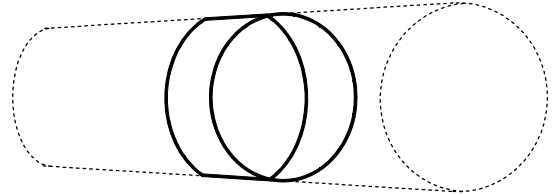
Insert the sensor into the mounting bracket and tie-wrap the sensor cable securely to the pipe band using the holes provided.

BAND
ADJUSTMENT JACK

VSJ PIPE MOUNTING BAND

SENSOR MOUNTING
BRACKET

DETAIL
BAND ADJUSTMENT
JACK
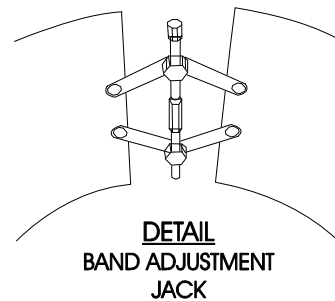
## OPTIONAL QZ02L-DP VELOCITY SENSOR MOUNTING

Mount the velocity sensor at or near the bottom of the channel or pipe in a position where it will be continuously submerged. The QZ02L-DP velocity sensor does not have to be parallel to the water surface. Position where silt or solids will not build-up on the sensor.

OPTIONAL PZ12-LP LEVEL SENSOR MOUNTING

Mount the PZ12-LP non-contacting ultrasonic level sensor in an unobstructed position at least 8" (203.2 mm) above the high water level. Install the stainless steel mounting bracket in a horizontal position (check with a level) and then insert the PZ12-LP sensor.

PZ12-LP SENSOR

MB12 - MOUNTING BRACKET
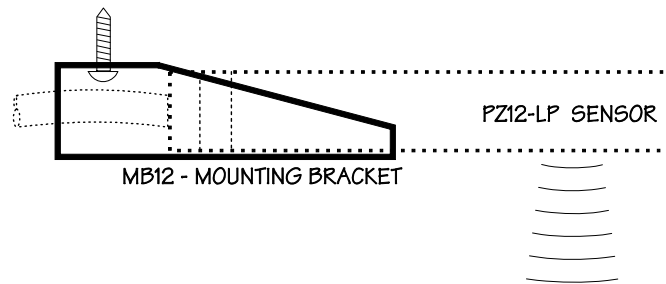
PZ12-LP MANHOLE MOUNTING

PZ12-LP

QZO2L-DP VELOCITY SENSOR

WATER
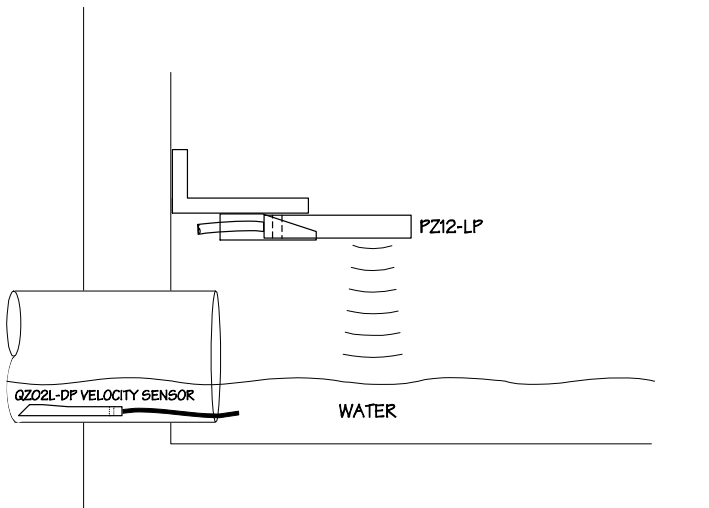
PZ12-LP PIPE MOUNTING

PZ12-LP

WATER
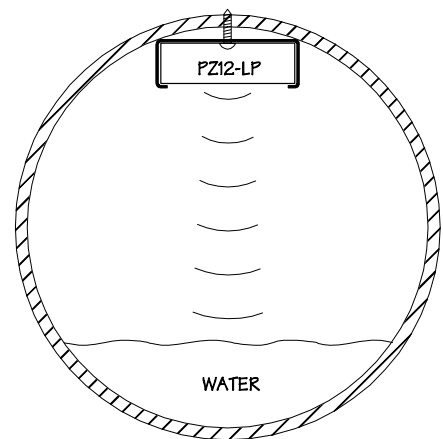
ENCLOSURE INSTALLATION

Locate the enclosure within 20 ft (6 m) of the sensor (up to 500 ft -150 m optional). The enclosure can be wall mounted with the four mounting screws (included) or panel mounted with Option PM Panel Mount kit from Greyline Instruments.

Avoid mounting the enclosure in direct sunlight to protect the electronics from damage due to overheating and condensate. In high humidity atmospheres, or where temperatures fall below freezing, Option TH Enclosure Heater and Thermostat is recommended. Seal conduit entries to prevent moisture from entering enclosure.

NEMA4X (IP66) WITH CLEAR COVER

1. Open hinged enclosure cover.

2. Insert #8 screws (supplied) through the four enclosure mounting holes to secure the enclosure to the wall or mounting stand.

Additional conduit holes can be cut in the bottom of the enclosure with a hole saw or Greenlee-type hole cutter.

DO NOT make conduit/wiring entries into the top of the enclosure.

Note: This non-metallic enclosure does not automatically provide grounding between conduit connections. Grounding must be provided as part of the installation. Ground in accordance with the requirements of the National Electrical Code. System grounding is provided by connecting grounding wires from all conduit entries to the steel mounting plate or another point which provides continuity.
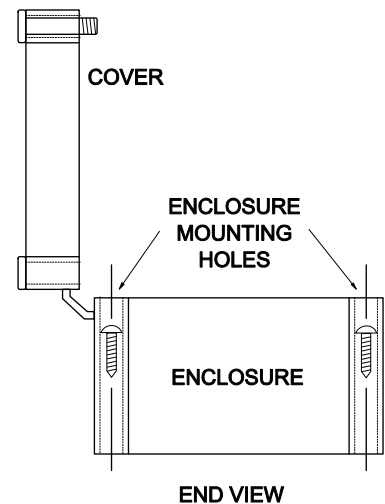
CLEANING

Cleaning is not required as a part of normal maintenance.

FIELD TROUBLESHOOTING

The AVFM 5.0 uses an ultrasonic level sensor to determine channel AREA and an ultrasonic Doppler sensor to measure flow VELOCITY.

The QZ02L transducer combines both sensors in one housing.

An optional configuration uses the PZ12-LP "down-looking" level sensor and a QZ02L-DP velocity sensor.

To troubleshoot the AVFM 5.0, verify correct operation of LEVEL and VELOCITY measurements separately.

Note: Selecting "Defaults" in the SPECIAL FUNCTION menu will return the instrument to "as-shipped" factory settings.

LEVEL (QZ02L SENSOR)

SYMPTOMS	FAULTS	SOLUTIONS
EC bar graph at zero	- very turbulent flow	- Increase LOE time (SPECIAL FUNCTION)
	- very aerated flow	- relocate sensor or use PZ12-LP
	- sensor not level	- level sensor with "Bullseye" level
	- sediment/dirt/grease build-up on sensor	- clean sensor with liquid soap
- Level display reads 1.0 inches	- Level at or less than 1.0 inches	

VELOCITY (QZ02L SENSOR)

| SYMPTOMS	FAULTS	SOLUTIONS
- No velocity reading	- Grease/sediment on sensor	- Clean sensor with detergent
	- Improper hook-up	- Check sensor connections

SENSOR CABLE RESISTANCE TEST

Unplug the green sensor terminal from the Doppler board and connect the sensor wires as shown. With a multimeter, perform resistance checks for each set of wires. One single loose terminal may cause false readings.

Test across shield and core of each wire: TMTR (black/white) and RCVR (black). Resistance should be approximately 82.5K ohms for any cable length. High readings indicate an open circuit and low readings indicate a short or partial short in the sensor cable.
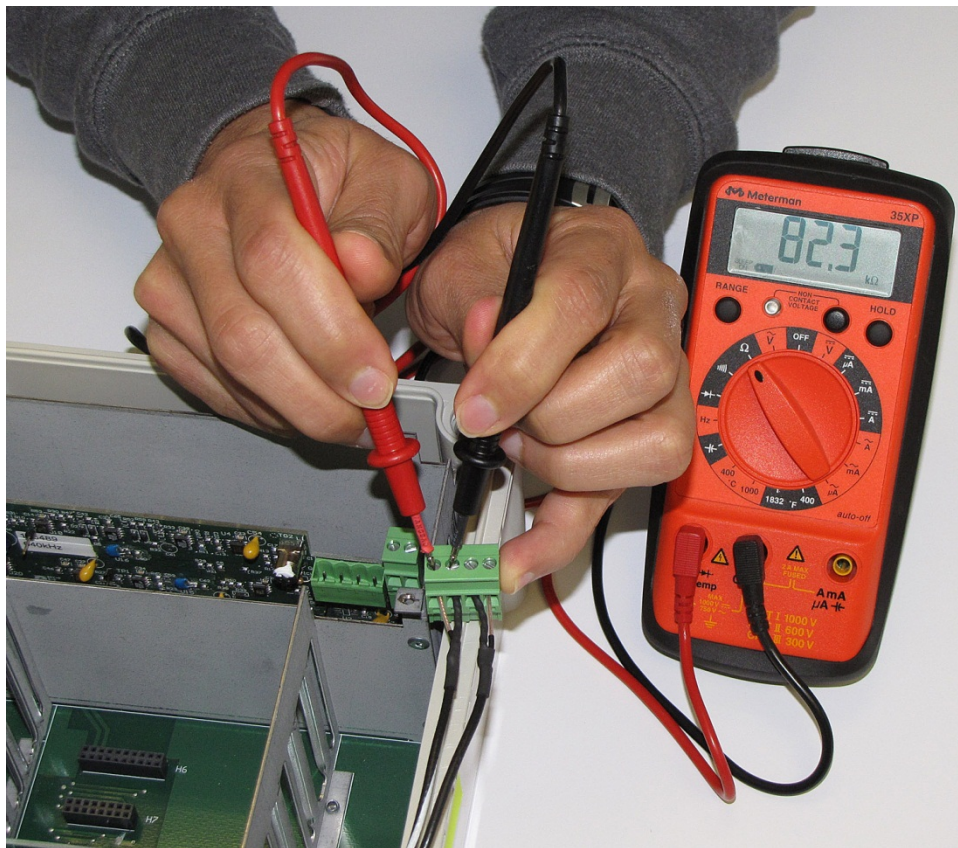
APPLICATIONS HOTLINE

For applications assistance, advice or information on any Greyline Instrument contact your Sales Representative, write to Greyline or phone the Applications Hotline below:

United States:	Tel: 315-788-9500	Fax: 315-764-0419
Canada:	Tel: 613-938-8956	Fax: 613-938-4857
Toll Free:	888-473-9546	
Email:	info@greyline.com	
Web Site:	www.greyline.com	

Greyline Instruments Inc.

Canada	USA:
16456 Sixsmith Drive	105 Water Street
Long Sault, Ont. K0C 1P0	Massena, NY 13662

PRODUCT RETURN PROCEDURE

Instruments may be returned to Greyline for service or warranty repair.

1 Obtain an RMA Number from Greyline -
Before shipping a product to the factory please contact Greyline by telephone, fax or email to obtain an RMA number (Returned Merchandise Authorization). This ensures fast service and correct billing or credit.

When you contact Greyline please have the following information available:

1. Model number / Software Version
2. Serial number
3. Date of Purchase
4. Reason for return (description of fault or modification required)
5. Your name, company name, address and phone number

2 Clean the Sensor/Product -

Important: unclean products will not be serviced and will be returned to the sender at their expense.

1. Rinse sensor and cable to remove debris.

2. If the sensor has been exposed to sewage, immerse both sensor and cable in a solution of 1 part household bleach (Javex, Clorox etc.) to 20 parts water for 5 minutes. Important: do not immerse open end of sensor cable.

3. Dry with paper towels and pack sensor and cable in a sealed plastic bag.

4. Wipe the outside of the enclosure to remove dirt or deposits.

5. Return to Greyline for service.

3 Ship to Greyline -
After obtaining an RMA number please ship the product to the appropriate address below:

Canadian and International Customers:	USA Customers:
Greyline Instruments Inc.	Greyline Instruments Inc.
16456 Sixsmith Drive	204 150th Avenue
Long Sault, Ont. K0C 1P0	Madeira Beach, FL 33708
RMA#	RMA#

AREA-VELOCITY FLOW DATA SHEET

Greyline Instruments Inc.	*Please complete and return this form to Greyline. It is important. We use this information to check our database for performance of Greyline flow meters in similar applications, and to provide advice and recommendations to you. Thanks for your cooperation.*
16456 Sixsmith Dr., Long Sault, Ont. K0C 1P0 *Tel: 613-938-8956 / Fax: 613-938-4857* *105 Water Street, Massena NY 13662* *Tel: 315-788-9500 / Fax: 315-764-0419*	

Contact: _____ Title/Dept.: _____

Company: _____ Project: _____

Address: _____

Tel: _____ Fax: _____

SENSOR:

Model/Type: _____ Cable Length: _____

Elec. Class: _____ Type of Pump: _____

Distance from nearest Pump, Controlling Valve, Orifice or open Discharge: _____

INSTRUMENT:

Model/Type: _____ Power Input: _____

Calibrated Range: _____ Indication: _____

Operating Temp.: _____ Alarm: _____

Enclosure Class: _____ Pulse/Unit: _____

Elec. Class: _____ Output: _____

SERVICE CONDITIONS:

Pipe ID: _____ ❑ Vertical   ❑ Horizontal

Pipe Mat'l: _____ % Solids: _____

Fluid: _____ Material Build-up: _____

Oper. Flow: _____ Vibration: _____

Max. Flow: _____ Max. Pressure: _____

Min. Flow: _____ Max. Temp: _____

Notes / Sketch Pipe Run:

LIMITED WARRANTY

_____

Greyline Instruments warrants, to the original purchaser, its products to be free from defects in material and workmanship for a period of one year from date of invoice. Greyline will replace or repair, free of charge, any Greyline product if it has been proven to be defective within the warranty period. This warranty does not cover any expenses incurred in the removal and re-installation of the product.

If a product manufactured by Greyline should prove defective within the first year, return it freight prepaid to Greyline Instruments along with a copy of your invoice.

This warranty does not cover damages due to improper installation or handling, acts of nature, or unauthorized service. Modifications to or tampering with any part shall void this warranty. This warranty does not cover any equipment used in connection with the product or consequential damages due to a defect in the product.

All implied warranties are limited to the duration of this warranty. This is the complete warranty by Greyline and no other warranty is valid against Greyline. Some states do not allow limitations on how long an implied warranty lasts or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Greyline Instruments Inc.

APPENDIX A – OPTIONS

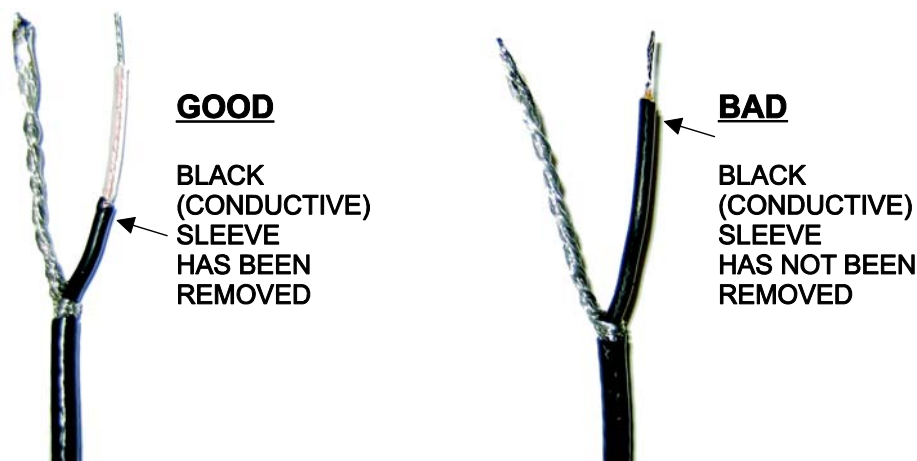### EXTRA SENSOR CABLE
(OPTION VXC)

Each Greyline AVFM 5.0 flow meter includes 25 ft. (7.6 m), 50 ft. (15 m) or 100 ft. (30 m) tri-coaxial sensor cable. This cable is shielded from electrical interference and is watertight with a polyurethane jacket. Additional cable and Cable Junction Box (Option VJB) may be ordered with the Flow Meter, or the cable may be spliced and extended up to 500 ft (152 m) total length as required during installation. No adjustment is required when the sensor cable is extended or shortened. Use only Greyline tri-coaxial VXC shielded cable, or run three RG174U coaxial cables in a metal conduit.

Extended sensor cable can be installed in conduit for mechanical protection. Recommended installation with a metal junction box is illustrated below:
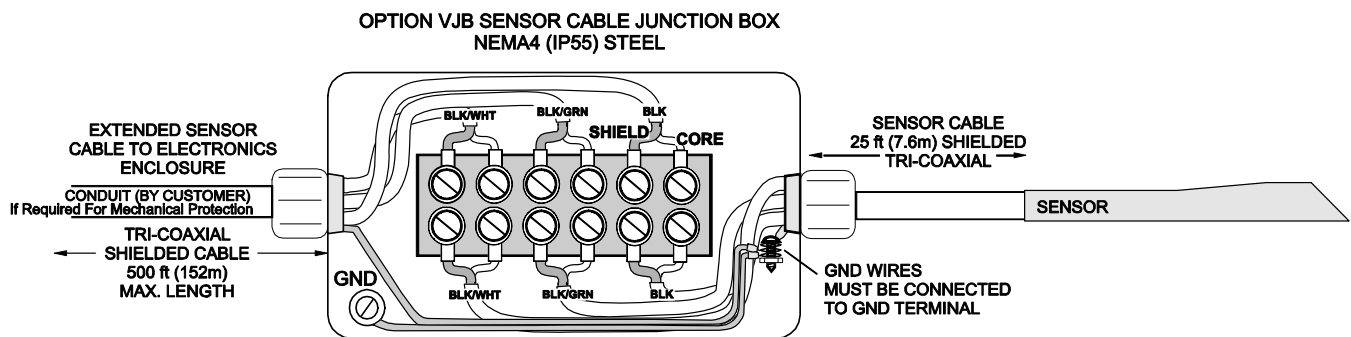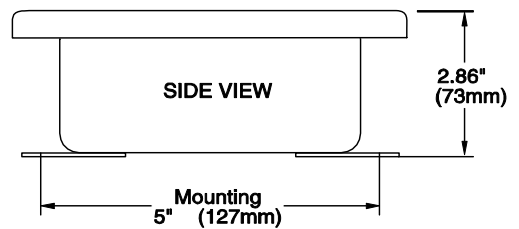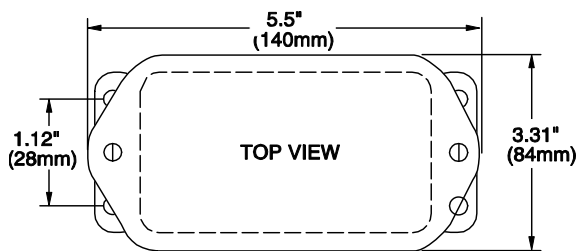

COAXIAL CABLE PREPARATION

VXC Doppler sensor cable can be cut and spliced up to a maximum length of 500 ft (152 m). Cable ends must be prepared as illustrated below.
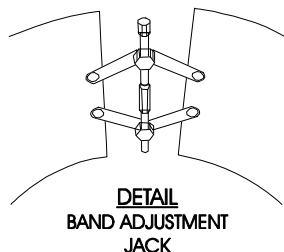
SENSOR CABLE JUNCTION BOX
(OPTION VJB)

Optional Watertight steel NEMA4 (IP55) Junction Boxes with terminal strips are available from Greyline Instruments.

DIMENSIONS
### OPTION VJB - JUNCTION BOX

SS PIPE MOUNTING BAND – OPTION VSJ

DETAIL
BAND ADJUSTMENT
JACK

Use optional VSJ stainless steel Pipe Mounting Bands for easy Sensor installation in round pipes.

Each Pipe Band includes:

✔ Band Adjustment Jack allowing ±0.5" (13 mm) adjustment from the nominal band size
✔ Stainless steel bracket for Sensor mounting
✔ Pre-drilled for tie wraps (included) to secure Sensor cable

BAND ADJUSTMENT JACK

VSJ PIPE MOUNTING BAND

SENSOR MOUNTING BRACKET
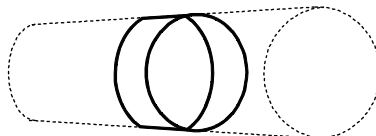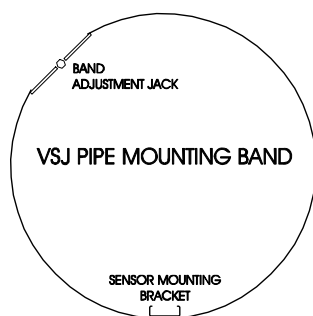
CODE	BAND SIZE
VSJ6	6"/150 mm ID pipes
VSJ8	8"/200 mm ID pipes
VSJ10	10"/250 mm ID pipes
VSJ12	12"/300 mm ID pipes
VSJ14	14"/350 mm ID pipes
VSJ15	15"/375 mm ID pipes
VSJ16	16"/400 mm ID pipes
VSJ18	18"/450 mm ID pipes
VSJ20	20"/500 mm ID pipes
VSJ24	24"/600 mm ID pipes
VSJ30	30"/750 mm ID pipes

END BRACKET

VSJ HALF-PIPE MOUNTING BAND

FLOW

ADJUSTMENT JACK

SENSOR MOUNTING BRACKET
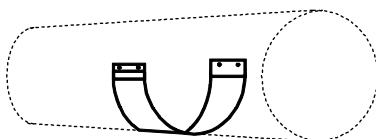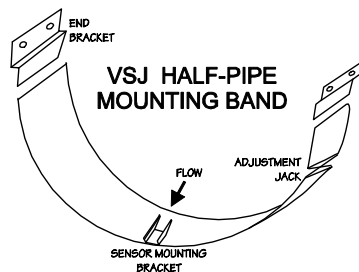
| VSJ32-40 | 32-40" / 800-1000 mm ID pipes |
| VSJ42-54 | 42-54" / 1100-1375 mm ID pipes |
| VSJ56-72 | 56-72" / 1400-1800 mm ID pipes |

Mounting Instructions:

Install the stainless steel pipe band with the sensor mounting bracket at the invert (bottom) of the pipe. Ensure that the sensor bracket is parallel to the water surface (check with a level). Mount so the tapered end of the sensor will point upstream and the sensor cable will point downstream. Turn the ¼" adjusting nut clockwise to expand the bracket and secure to the pipe wall by friction fit.

Insert the sensor into the mounting bracket and tie wrap the sensor cable securely to the stainless steel pipe band.

FASTEN SENSOR CABLE TO PIPE OR CHANNEL WITH TIE WRAPS

END VIEW

SENSOR
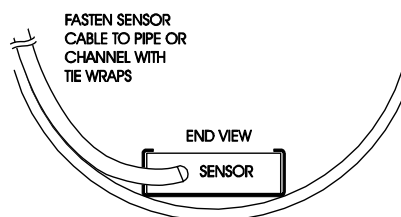
ENCLOSURE HEATER AND THERMOSTAT - Option TH

Instruments can be factory-equipped with an Enclosure Heater and Thermostat or the module can be customer-installed. The Thermostat is factory set to turn ON at 40°F (4.5°C) and OFF at 60°F (15.5°C). Power consumption is 15 Watts.

TO AC POWER SUPPLY
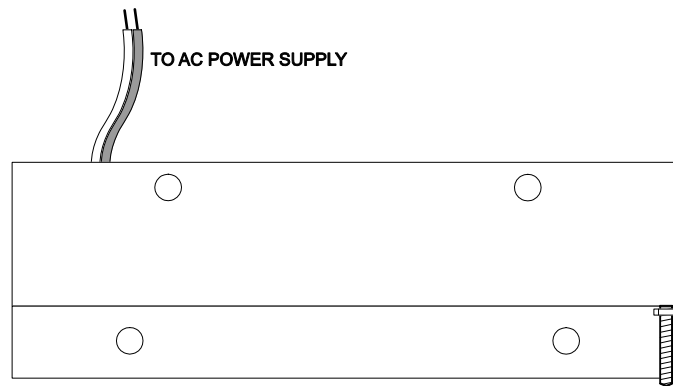
ENCLOSURE SUNSCREEN - Option SCR

Do not mount instrument electronics in direct sunlight. Overheating will reduce the life of electronic components and condensate may form during the heat/cool cycles and cause electrical shorts.

Note:

Exposure to direct sunlight can cause overheating and moisture condensation which will reduce the operating life of electronics.

Protect Instruments from direct sunlight with this iridite finished aluminum sun screen (Greyline Option SCR).

Seal conduit entries with caulking compound to further reduce moisture condensation.

11" / 280 mm

11"
280 mm

5"
127 mm
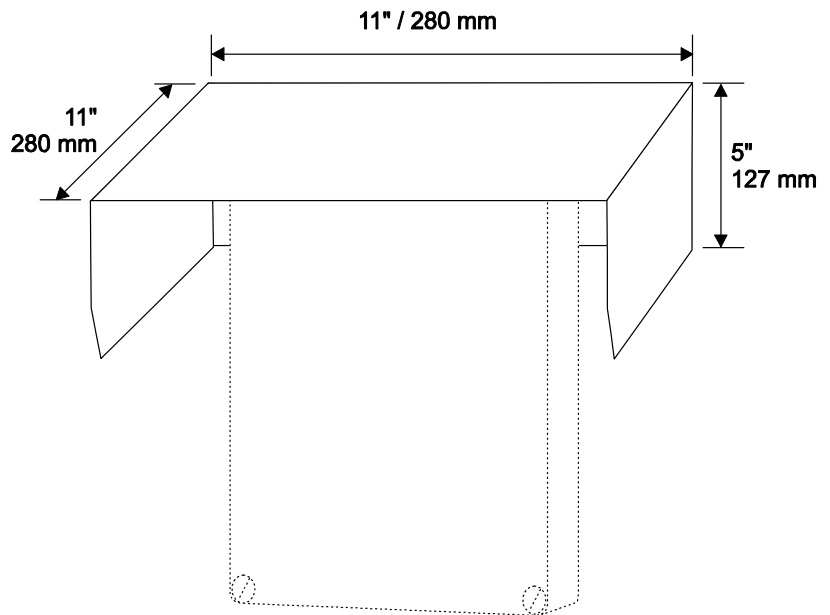
POWER INPUT OPTION
9-32VDC

AVFM 5.0 Flow Meters may be ordered factory-configured for 9-32VDC power input.

QUICK BENCH TEST:

Connect Sensor as shown below, then Power. Test operation of the AVFM 5.0 by holding the sensor in one hand and rubbing your thumb or fingers briskly across the face (plastic surface) of the sensor. Allow 15 seconds for the AVFM 5.0 to process the signal and display a flow value.

CONNECTIONS:

POWER INPUT: Connect 9-32VDC to the + and - terminals. The Power Input GND terminal must be connected to the nearest Ground pole. A 1-amp fuse in line is recommended.
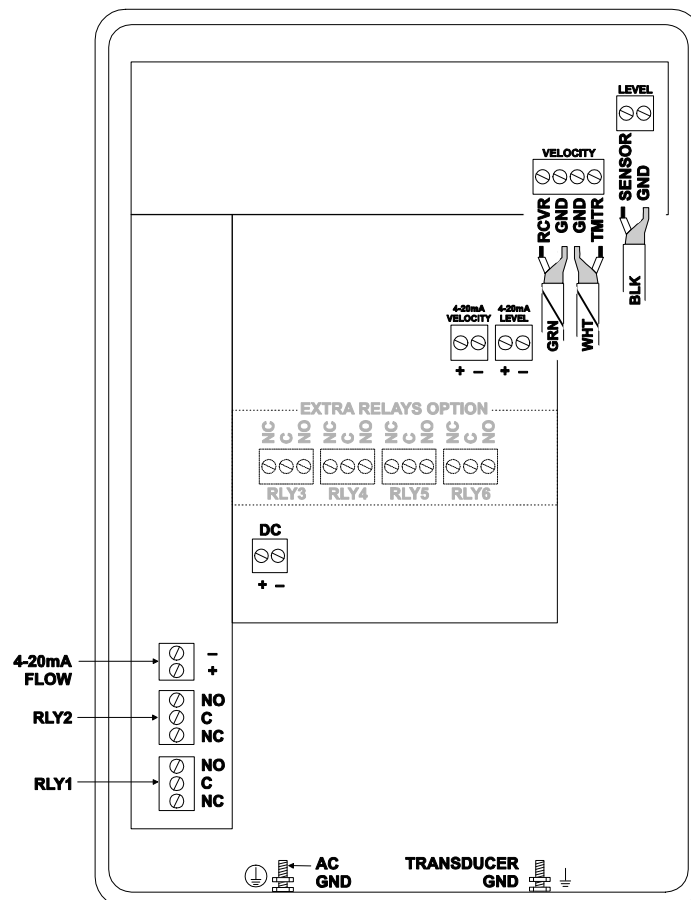
```
--Data Logging-------
▶Log Site ID       00
                   99
 Mode           Flow
            Velocity
 Set Date  Feb 18/2008
           Mar 19/2009
 Set Time     11:27:40
              12:28:41
 Interval       10sec
                60min
                30min
                10min
                 5min
                 2min
                 1min
                30sec
 Log             Stop
                Start
               Delete
```

DATA LOGGING (Optional)

Setup

Select `Data Logging` from Menu Selections.

`Log Site ID` Enter a number from `00` to `99`. The site ID will become part of the downloaded file name to help distinguish downloads from different instruments. Press ✓ to store the setting.

`Mode` Select `Velocity`, `Level` or `Flow`. Press ✓ to store the setting.

`Set Date` Press ⬆ or ⬇ to scroll and select Month, Day and Year. Press ✓ to store the setting.

`Set Time` Press ⬆ or ⬇ to select the current time in Hours, Minutes and Seconds. Press ✓ to store the setting.

`Interval` Press ⬆ or ⬇ to select the logging interval. Flow rate reading will be stored at each time interval. Press ✓ to store the setting.

Note: Press ⬇ to Log ➡ and ⬆ or ⬇ to Delete and ✓ to delete the log file. Press ➡ and ⬆ or ⬇ to Start and ✓ to restart the logger.

`Log` `Stop`, `Start` or `Delete` the log file. You <u>MUST</u> delete old file and start a new log to apply any changes that have been made to the `Log Site ID`, `Mode` or `Interval`.

View 24-hr formatted Reports on the AVFM 5.0 display. Press ⬅ from the RUN display to view a formatted flow report from instruments with a built-in data logger. Press ⬅ to pan through `Level`, `Velocity` and `Flow` summaries. Press ⬇ to scroll down one day or repeatedly to scroll to a specific date. Up to 365 days can be stored. Newest date will overwrite the oldest. Press ✓ to return to the main display.

RETRIEVE LOG FILE

Plug a USB Flash Memory Drive (not supplied by Greyline) into the USB output cable from the instrument. The instrument display will show the message `Downloading` until the log file is transferred to the memory card and then display `Completed`. The USB flash drive may be removed.

Download file names will appear in this format:

`AVFM_ _00A.LOG`

MODEL   TAG DOWNLOAD

Tag is set according to the `Log Site ID` entered in the instrument Data Logging menu.

Download letter will be A for the first download from an instrument. B for the second, then C etc. At the letter Z a - character will appear indicating that the maximum number of downloads for that instrument are on the USB flash drive. Older files can be erased or moved from the flash memory drive or a new memory drive can be used.
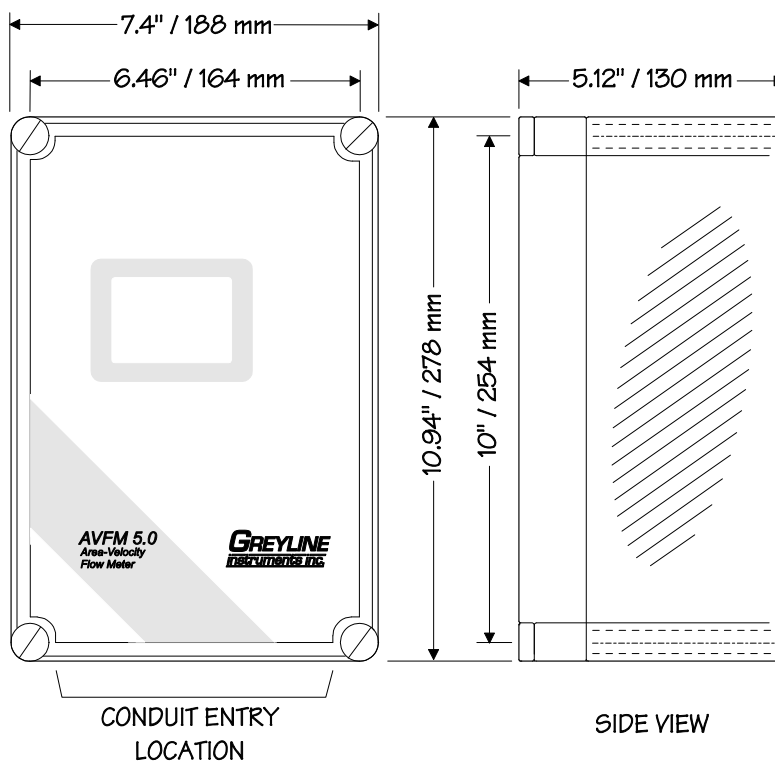
OPENING LOG FILES

Install Greyline Logger on your PC or laptop. Refer to the Help menu in the program for detailed instructions.

Select File/Open/Instrument Log (.log) to open the log file from your USB flash drive.
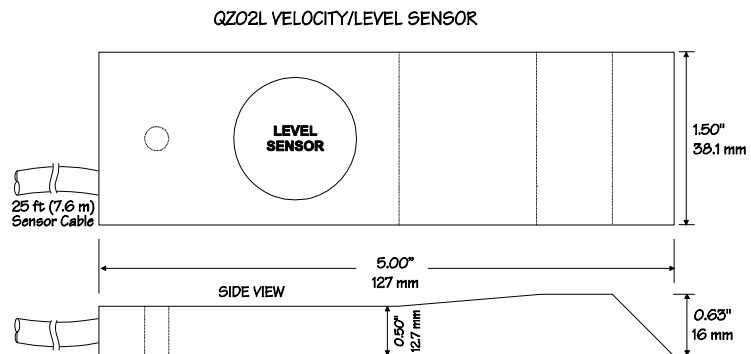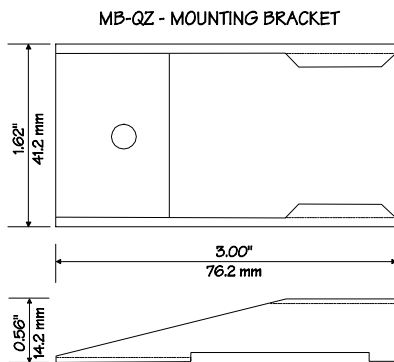
SPECIFICATIONS

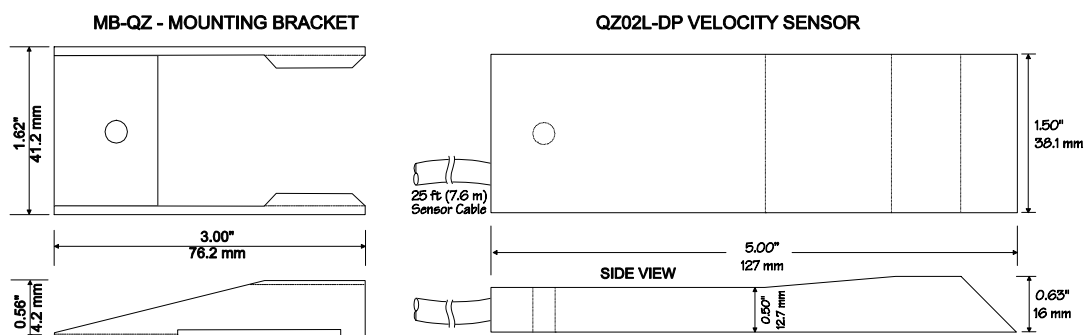|	
Electronics Enclosure:	NEMA4X (IP 66), watertight and dust tight, polycarbonate with clear, shatterproof hinged Lexan cover
Accuracy:	Level: ± 0.25% of Range Velocity: ± 2% of Reading Repeatability: 0.1% F.S., Linearity: 0.1%F.S.
Display:	White, backlit matrix – displays flow rate, totalizer, relay states, operating mode and calibration menu
Programming:	Built-in 5-key calibrator with English, French or Spanish language selection
Power Input:	100-240VAC, 50/60 Hz, (30 W max.) Optional: 9-32VDC (9 W max.)
Output:	2 Isolated 4-20mA, 1000 ohm load maximum or 2 Isolated 0-5V
Control Relay:	Qty 2, rated 5 ampere SPDT
Temperature Compensation:	Automatic, temperature probe built in to level Sensor
Electrical Surge Protection:	Sensor, 4-20mA, AC power input
Environmental Conditions:	Relative humidity up to 80% -23 to 60°C ambient temperature, maximum 5000 m altitude, pollution degree 4, Installation Category II. Optional Enclosure Heater recommended for condensation protection below 32°F (-1°C)

7.4" / 188 mm
6.46" / 164 mm
5.12" / 130 mm
10.94" / 278 mm
10" / 254 mm

AVFM 5.0
Area-Velocity
Flow Meter

CONDUIT ENTRY
LOCATION

SIDE VIEW

Velocity/Level Sensor QZ02L

Minimum Velocity:	0.1 ft/sec (0.03 m/sec)
Maximum Velocity:	20 ft/sec (6.2 m/sec) [reverse flow to -5 ft/sec (-1.5 m/sec)]
Minimum Head:	1 in. (25.4 mm)
Maximum Head:	16 ft. (4.88 m)
Operating Temperature:	5 to 150°F (-15 TO 65°C)
Exposed Materials:	PVC, epoxy resin, polyurethane, ultem
Sensor Cable:	25 ft. (7.6 m) submersible polyurethane jacket, shielded, 3 coaxial
Hazardous Rating:	CSA rated Intrinsically Safe Class I, Groups C,D, Class II, Groups E,F,G with optional Intrinsic Safety Barrier

MB-QZ - MOUNTING BRACKET

QZ02L VELOCITY/LEVEL SENSOR

Optional (Velocity only) Sensor QZ02L-DP

Minimum Velocity:	0.1 ft/sec (0.03 m/sec)
Maximum Velocity:	20 ft/sec (6.2 m/sec) [reverse flow to -5 ft/sec (-1.5 m/sec)]
Operating Temperature:	5 to 150°F (-15 to 65°C)
Exposed Materials:	PVC, epoxy resin, polyurethane, ultem
Sensor Cable:	25 ft (7.6 m) submersible polyurethane jacket, shielded, 3-coaxial
Hazardous Rating:	CSA rated Intrinsically Safe Class I, Groups C,D, Class II, Groups E,F,G, with optional Intrinsic Safety Barrier

MB-QZ - MOUNTING BRACKET

QZ02L-DP VELOCITY SENSOR

1.62"
41.2 mm

3.00"
76.2 mm

0.56"
14.2 mm

1.50"
38.1 mm

25 ft (7.6 m)
Sensor Cable

SIDE VIEW

5.00"
127 mm

0.50"
12.7 mm

0.63"
16 mm

Optional Sensor PZ12-LP

Maximum Range:	12 ft (3.66 m)
Minimum Range:	8" (203.2 mm)
Beam Angle:	8°
Operating Temperature:	-40 to 150°F (-40 to 65°C)
Exposed Materials:	Sensor - PVC, Mounting Bracket - 316 Stainless
	Hazardous Rating: CSA rated Intrinsically Safe Class I, Groups C,D,Class II, Groups E,F,G with optional Intrinsic Safety Barrier

MB12 - MOUNTING BRACKET

PZ12-LP ULTRASONIC SENSOR

3.12"
79.2 mm

0.218 DIA
(5.5 mm)

3.00"
76.2 mm

0.68"
17.3 mm

25 ft (7.6 m)
Coaxial Cable

FACE
VIEW

0.25 DIA
(6.35 mm)

3.00"
76.2 mm

SIDE
VIEW

4.00"
101.6 mm

0.62"
15.75 mm